Hollenbeck River

Watershed Summary

WATERSHED DESCRIPTION AND MAPS

The Hollenbeck River watershed covers an area of approximately 17,048 acres in northwestern Connecticut (Figure 1). The watershed is located in the Towns of North Canaan, Canaan, Cornwall, and Goshen, CT.

The Hollenbeck River watershed includes one segment impaired for recreation due to elevated bacteria levels. This segment was assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and included in the CT 2010 303(d) list of impaired waterbodies. An excerpt of the Integrated Water Quality Report is included in Table 1 to show the status of other waterbodies in the watershed (CTDEEP, 2010).

The entire length (18.32 miles) of the Hollenbeck River (CT6200-00_01) is impaired. This impaired river begins upstream of Cornwall Hollow Road (Route 43) crossing and north of Route 4 in Cornwall, flows north following Route 43 to the intersection of Route 43 and Route 63, enters Canaan, follows west parallel to Route 63, crosses Route 7 and Route 126, and ends at the confluence with the Housatonic River in Canaan.

The impaired segment of Hollenbeck River has a water quality classification of A. Designated uses include potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. As there are no designated beaches in this segment of Hollenbeck River, the specific recreation impairment is for non-designated swimming and other water contact related activities.

Impaired Segment Facts

Impaired Segment: Hollenbeck River (CT6200-00_01)

Towns: Canaan, Cornwall

Impaired Segment Length (miles): 18.32

Water Quality Classification: Class A

Designated Use Impairment: Recreation

Sub-regional Basin Name and Code: Hollenbeck River, 6200

Regional Basin: Hollenbeck

Major Basin: Housatonic

Watershed Area (acres): 17,048

MS4 Applicable? No

Figure 1: Watershed location in Connecticut

Table 1: Impaired segment and nearby waterbodies from the Connecticut 2010 Integrated Water Quality Report

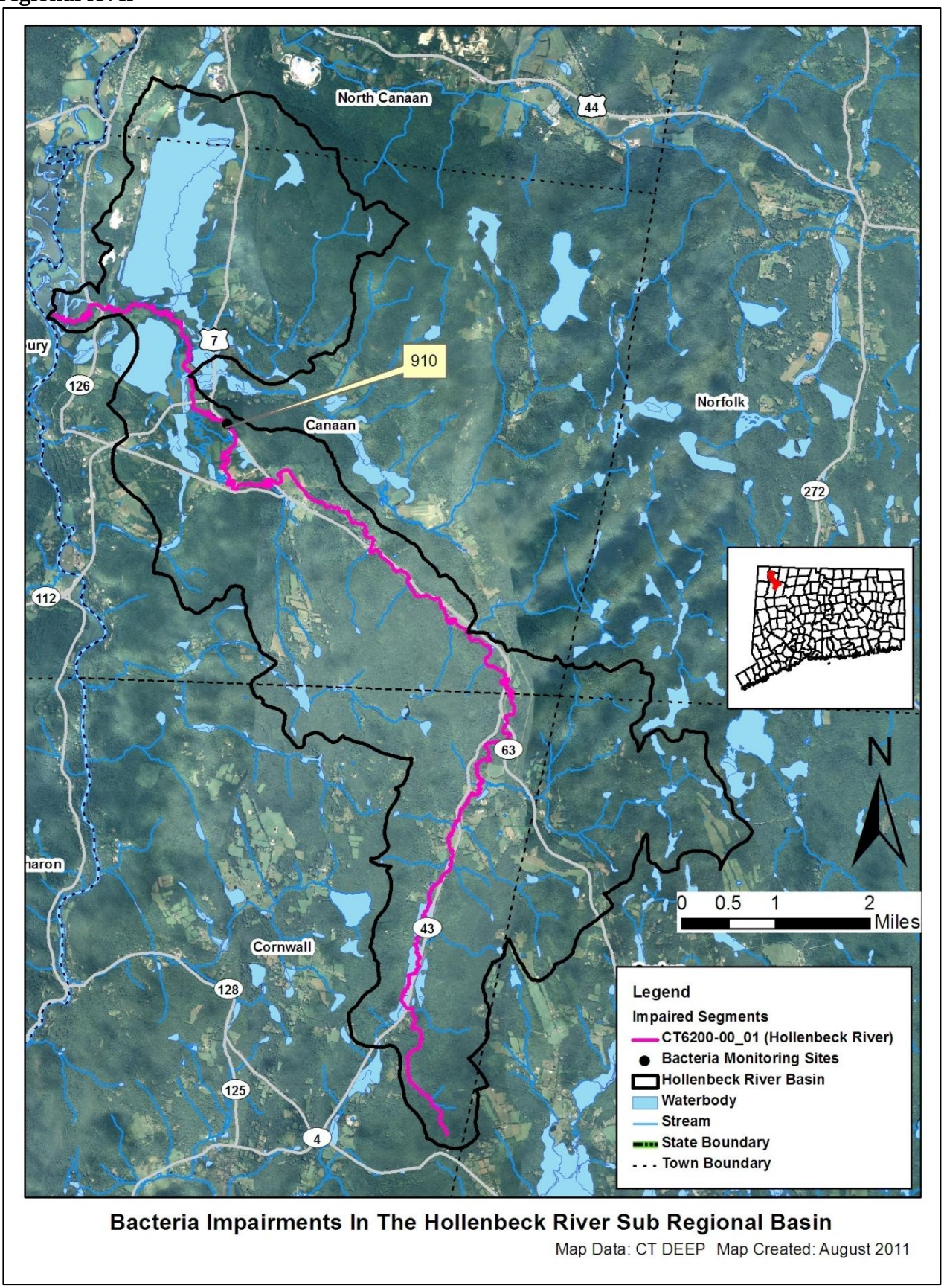
Waterbody ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation	Fish Consumption
CT6200-00_01	Hollenbeck River-01	From mouth at confluence with Housatonic River (DS of Point of Rock Road (Route 126) crossing), Canaan, US to headwaters (US of Cornwall Hollow Road (Route 43) crossing), Cornwall.	18.32	FULL	NOT	FULL

FULL = Designated Use Fully Supported

NOT = Designated Use Not Supported

U = Unassessed

Figure 2: GIS map featuring general information of the Hollenbeck River watershed at the sub-regional level



Land Use

Existing land use can affect the water quality of waterbodies within a watershed (USEPA, 2011c). Natural processes, such as soil infiltration of stormwater and plant uptake of water and nutrients, can occur in undeveloped portions of the watershed. As impervious surfaces (such as rooftops, roads, and sidewalks) increase within the watershed landscape from commercial, residential, and industrial development, the amount of stormwater runoff to waterbodies also increases. These waterbodies are negatively affected as increased pollutants from nutrients and bacteria from failing and insufficient septic systems, oil and grease from automobiles, and sediment from construction activities become entrained in this runoff. Agricultural land use activities, such as fertilizer application and manure from livestock, can also increase pollutants in nearby waterbodies (USEPA, 2011c).

As shown in Figures 3 and 4, the Hollenbeck River watershed consists of 73% forest, 11% agriculture, 10% water, and 6% urban land uses. The watershed from the headwaters of the impaired river to the intersection of Route 43 and Route 63 is characterized by forested land and agricultural fields with potential livestock pastures. Exposed banks were identified between Lake Road and Ford Hill Road along Route 43 in Cornwall. From Route 63 in Cornwall into Canaan to Cobble Road, the impaired river flows through forested land with some residential housing and agricultural fields with disturbed banking. A possible horse pasture was identified south of Cobble Road along Route 63 in Canaan. Downstream of Cobble Road are significant agricultural fields, both hay and row crops, major exposed mowed banks particularly immediately downstream of the Route 7 crossing, urban residential development around the Route 7 and Route 63 intersection, and forested land within an agricultural mosaic from the Route 7 crossing to its confluence with the Housatonic River.

Figure 3: Land use within the Hollenbeck River watershed

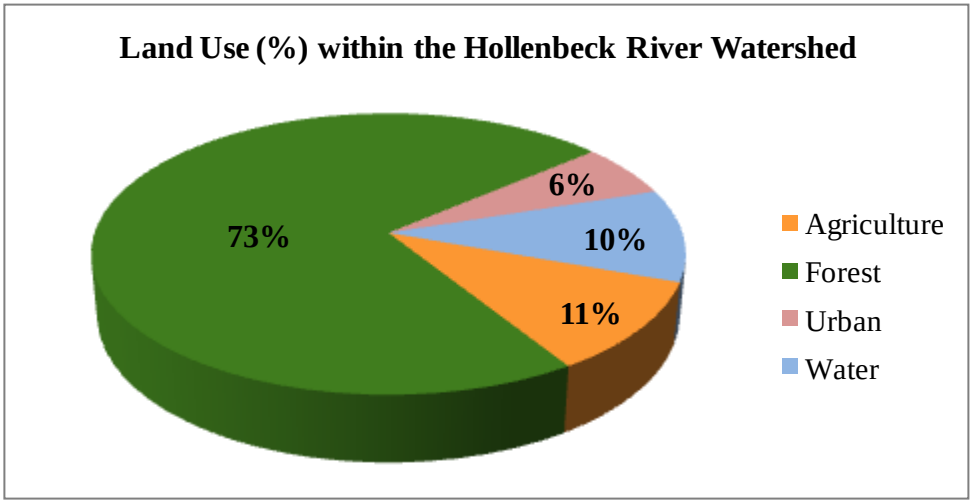
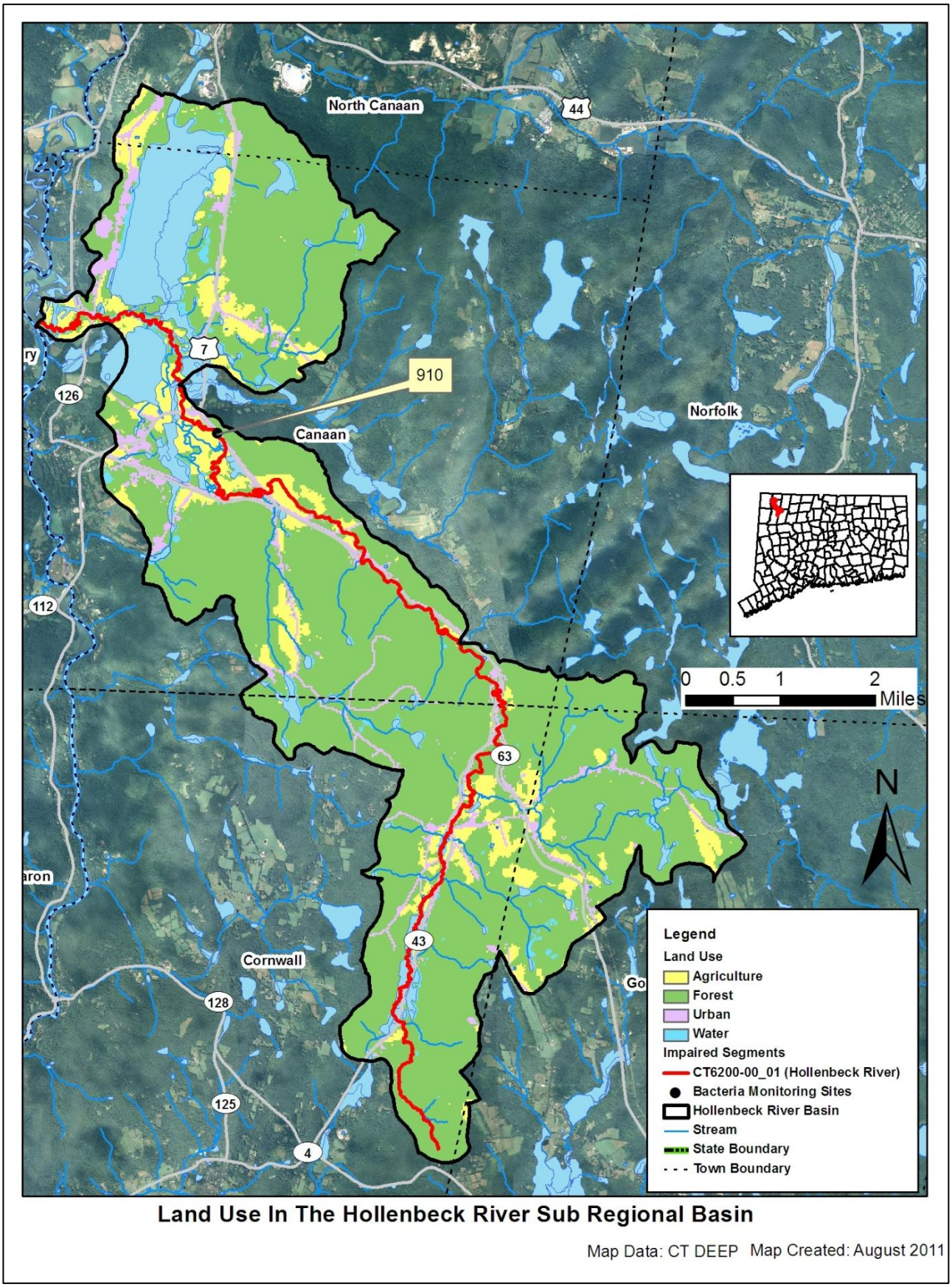


Figure 4: GIS map featuring land use for the Hollenbeck River watershed at the sub-regional level



WHY IS A TMDL NEEDED?

E. coli is the indicator bacteria used for comparison with the CT State criteria in the CT Water Quality Standards (WQS) (CTDEEP, 2011). All data results are from CT DEEP, USGS, Bureau of Aquaculture, or volunteer monitoring efforts at stations located on the impaired segments.

Table 2: Sampling station location description for impaired segments in the Hollenbeck River watershed

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT6200-00_01	Hollenbeck River	910	Rte 63 at SNET pole #856	Canaan	41.958117	-73.331647

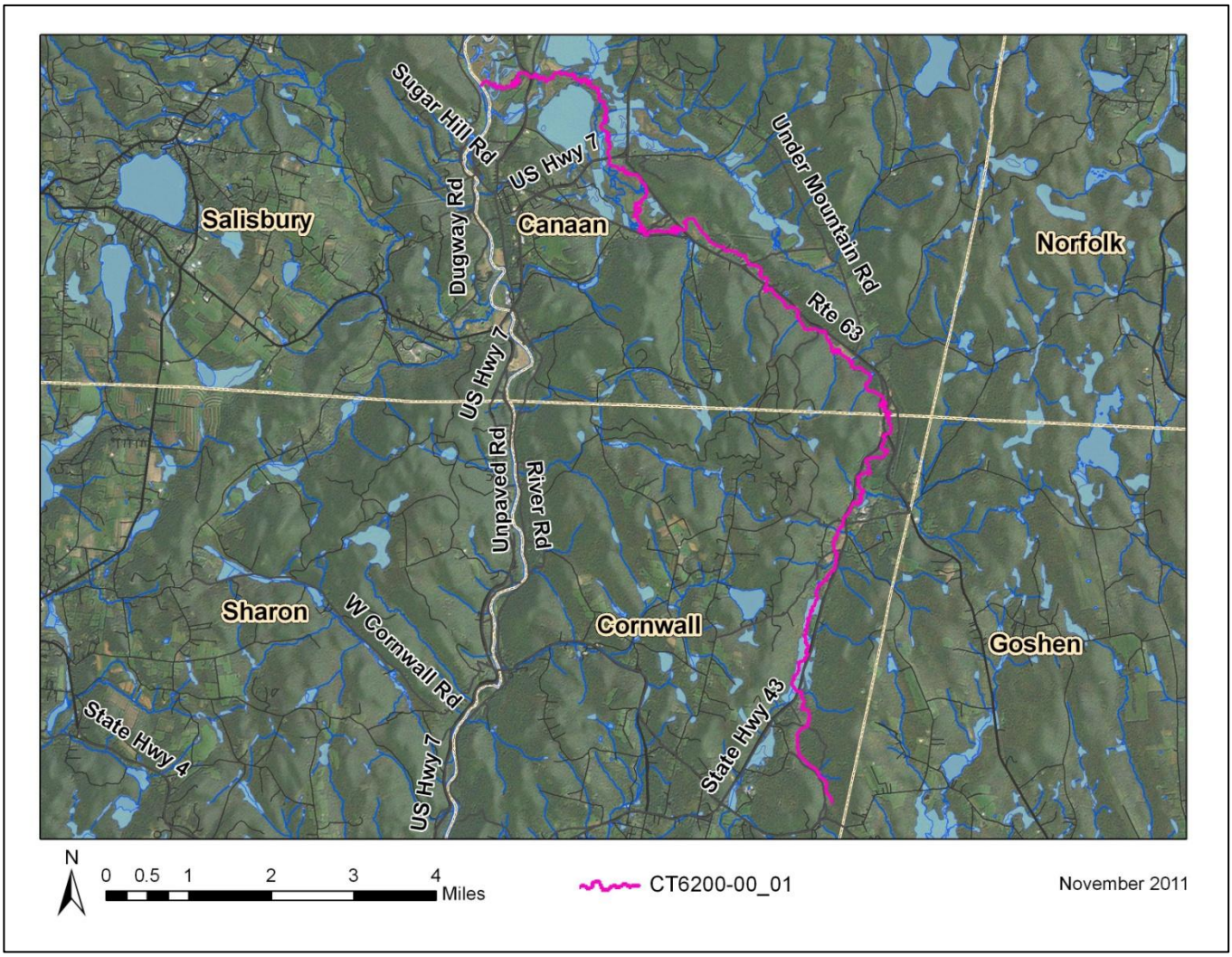
Hollenbeck River (CT6200-00_01) is a Class A freshwater river (Figure 5). Its applicable designated uses are potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. Water quality analyses were conducted using data from one sampling location from 2003-2004 and 2006-2009 (Station 910) (Table 2).

The water quality criteria for *E. coli*, along with bacteria sampling results for Station 910 from 2003-2004 and 2006-2009, are presented in Table 7. The annual geometric mean was calculated for Station 910 and exceeded the WQS for *E. coli* in all sampling years, except 2004. The geometric mean for 2004 could not be calculated due to insufficient data requirements. Single sample values at this station exceeded the WQS for *E. coli* in all sampling years on at least one sample date, except 2004.

To aid in identifying possible bacteria sources, the geometric mean was also calculated for each station for wet-weather and dry-weather sampling days, where appropriate (Table 7). For the impaired segment of Hollenbeck River, geometric mean values at Station 910 exceeded the WQS for *E. coli* during both wet and dry-weather with wet weather more than twice dry weather.

Due to the elevated bacteria measurements presented in Table 7, this segment of Hollenbeck River did not meet CT's bacteria WQS, was identified as impaired, and was placed on the CT List of Waterbodies Not Meeting Water Quality Standards, also known as the CT 303(d) Impaired Waters List. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with State WQS.

Figure 5: Aerial map of Hollenbeck River



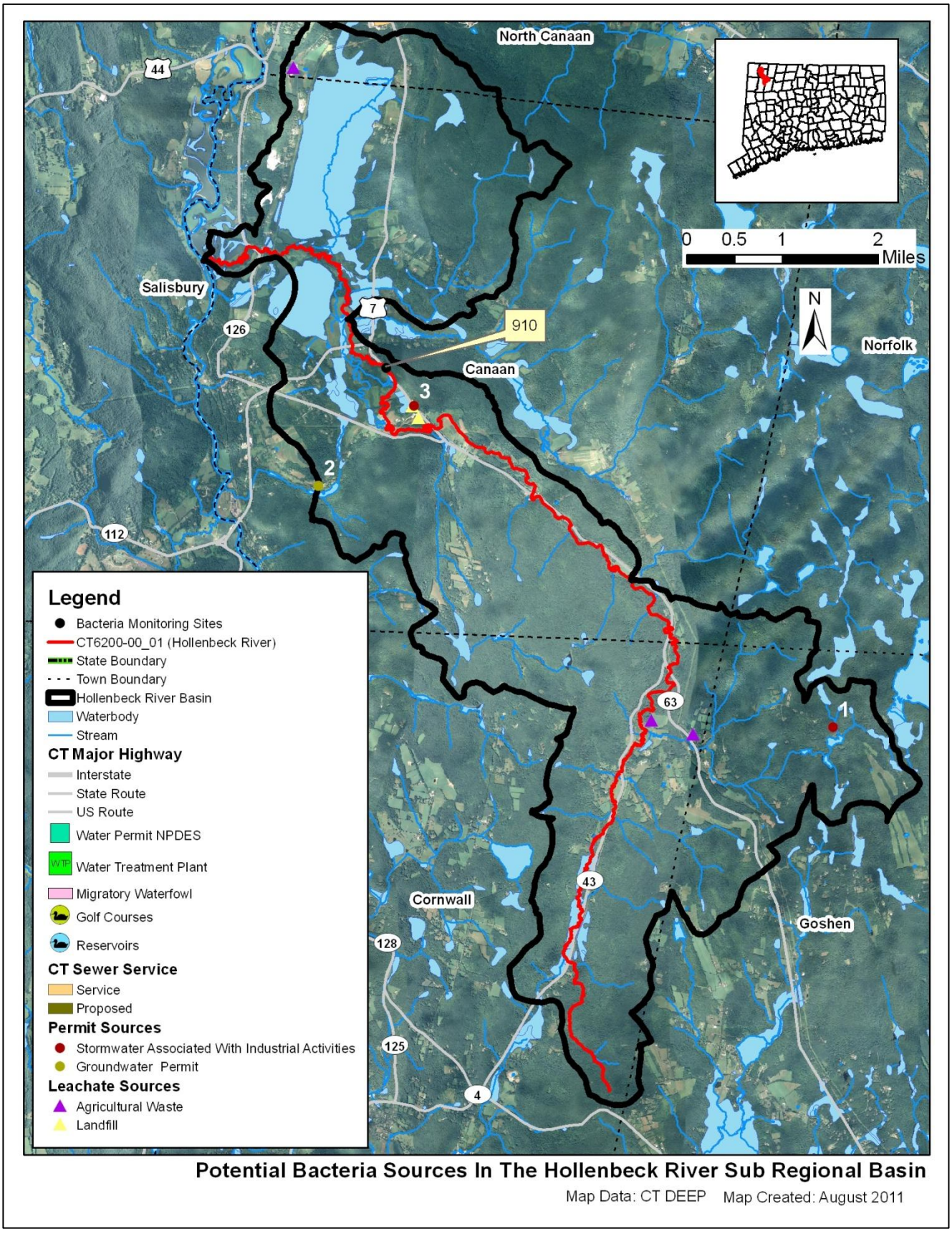
POTENTIAL BACTERIA SOURCES

Potential sources of indicator bacteria in a watershed include point and non-point sources, such as stormwater runoff, agriculture, sanitary sewer overflows (collection system failures), illicit discharges, and inappropriate discharges to the waterbody. Potential sources that have been tentatively identified in the watershed based on land use (Figures 3 and 4) and a collection of local information for the impaired waterbody is presented in Table 3 and Figure 6. However, the list of potential sources is general in nature and should not be considered comprehensive. There may be other sources not listed here that contribute to the observed water quality impairment in the study segments. Further monitoring and investigation will confirm listed sources and discover additional ones. Some segments in this watershed are currently listed as unassessed by CT DEEP procedures. This does not suggest that there are no potential issues on this segment, but indicates a lack of current data to evaluate the segment as part of the assessment process. For some segments, there are data from permitted sources, and CT DEEP recommends that any elevated concentrations found from those permitted sources be addressed through voluntary reduction measures. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement these TMDLs.

Table 3: Potential bacteria sources in the Hollenbeck River watershed

Impaired Segment	Permit Source	Illicit Discharge	CSO/ SSO Issue	Failing Septic System	Agricultural Activity	Stormwater Runoff	Nuisance Wildlife/Pets	Other
Hollenbeck River CT6200-00_01	**x**			**x**	**x**	**x**	**x**	

Figure 6: Potential sources in the Hollenbeck River watershed at the sub-regional level



The potential sources map for the impaired basin was developed after thorough analysis of available data sets. If information is not displayed in the map, then no sources were discovered during the analysis. The following is the list of potential sources that were evaluated: problems with migratory waterfowl, golf course locations, reservoirs, proposed and existing sewer service, cattle farms, poultry farms, permitted sources of bacteria loading (surface water discharge, MS4 permit, industrial stormwater, commercial stormwater, groundwater permits, and construction related stormwater), and leachate and discharge sources (agricultural waste, CSOs, failing septic systems, landfills, large septic tank leach fields, septage lagoons, sewage treatment plants, and water treatment or filter backwash).

Point Sources

Permitted sources within the watershed that could potentially contribute to the bacteria loading are identified in Table 4. This table includes permit types that may or may not be present in the impaired watershed. A list of active permits in the watershed is included in Table 5. Additional investigation and monitoring may reveal the presence of additional discharges in the watershed. Available effluent data from each of these permitted categories found within the watershed are compared to the CT State WQS for the appropriate receiving waterbody use and type.

Table 4: General categories list of other permitted discharges

Permit Code	Permit Description Type	Number in watershed
CT	Surface Water Discharges	0
GPL	Discharge of Swimming Pool Wastewater	0
GSC	Stormwater Discharge Associated with Commercial Activity	0
GSI	Stormwater Associated with Industrial Activity	2
GSM	Part B Municipal Stormwater MS4	0
GSN	Stormwater Registration – Construction	0
LF	Groundwater Permit (Landfill)	0
UI	Underground Injection	1

Permitted Sources

As shown in Table 5, there are multiple permitted discharges in the Hollenbeck River watershed. Bacteria data are currently not available for any of the permitted discharges in the watershed. Since the MS4 permits are not targeted to a specific location, but the geographic area of the regulated municipality, there is no one accurate location on the map to display the location of these permits. One dot will be displayed at the geographic center of the municipality as a reference point. Sometimes this location falls outside of the targeted watershed and therefore the MS4 permit will not be displayed in the Potential Sources Map. Using the municipal border as a guideline will show which areas of an affected watershed are covered by an MS4 permit.

Table 5: Permitted facilities within the Hollenbeck River watershed

Town	Client	Permit ID	Permit Type	Site Name/Address	Map #
Falls Village	Town Of North Canaan	GSI001502	Stormwater Associated With Industrial Activities	Canaan Transfer Station	3
Falls Village	Camp Isabella Freedman, Inc.	UI0000266	Groundwater Permit	Isabella Freedman Jewish Retreat Center	2
Goshen	Ike's Auto Body, Inc.	GSI000993	Stormwater Associated With Industrial Activities	Ike's Auto Body, Inc.	1

Municipal Stormwater Permitted Sources

Per the EPA Phase II Stormwater rule all municipal storm sewer systems (MS4s) operators located within US Census Bureau Urbanized Areas (UAs) must be covered under MS4 permits regulated by the appropriate State agency. There is an EPA waiver process that municipalities can apply for to not participate in the MS4 program. In Connecticut, EPA has granted such waivers to 19 municipalities. All participating municipalities within UAs in Connecticut are currently regulated under MS4 permits by CT DEEP staff in the MS4 program.

The US Census Bureau defines a UA as a densely settled area that has a census population of at least 50,000. A UA generally consists of a geographic core of block groups or blocks that exceeds the 50,000 people threshold and has a population density of at least 1,000 people per square mile. The UA will also include adjacent block groups and blocks with at least 500 people per square mile. A UA consists of all or part of one or more incorporated places and/or census designated places, and may include additional territory outside of any place. (67 FR 11663)

For the 2000 Census a new geographic entity was created to supplement the UA blocks of land. This created a block known as an Urban Cluster (UC) and is slightly different than the UA. The definition of a UC is a densely settled area that has a census population of 2,500 to 49,999. A UC generally consists of a geographic core of block groups or blocks that have a population density of at least 1,000 people per square mile, and adjacent block groups and blocks with at least 500 people per square mile. A UC consists of all or part of one or more incorporated places and/or census designated places; such a place(s) together with adjacent territory; or territory outside of any place. The major difference is the total population cap of 49,999 people for a UC compared to >50,000 people for a UA. (67 FR 11663)

While it is possible that CT DEEP will be expanding the reach of the MS4 program to include UC municipalities in the near future they are not currently under the permit. However, the GIS layers used to create the MS4 maps in this Statewide TMDL did include both UA and UC blocks. This factor creates some municipalities that appear to be within an MS4 program that are not currently regulated through an MS4 permit. This oversight can explain a municipality that is at least partially shaded grey in the maps and there are no active MS4 reporting materials or information included in the appropriate appendix. While these areas are not technically in the MS4 permit program, they are still considered urban by the cluster definition above and are likely to contribute similar stormwater discharges to affected waterbodies covered in this TMDL.

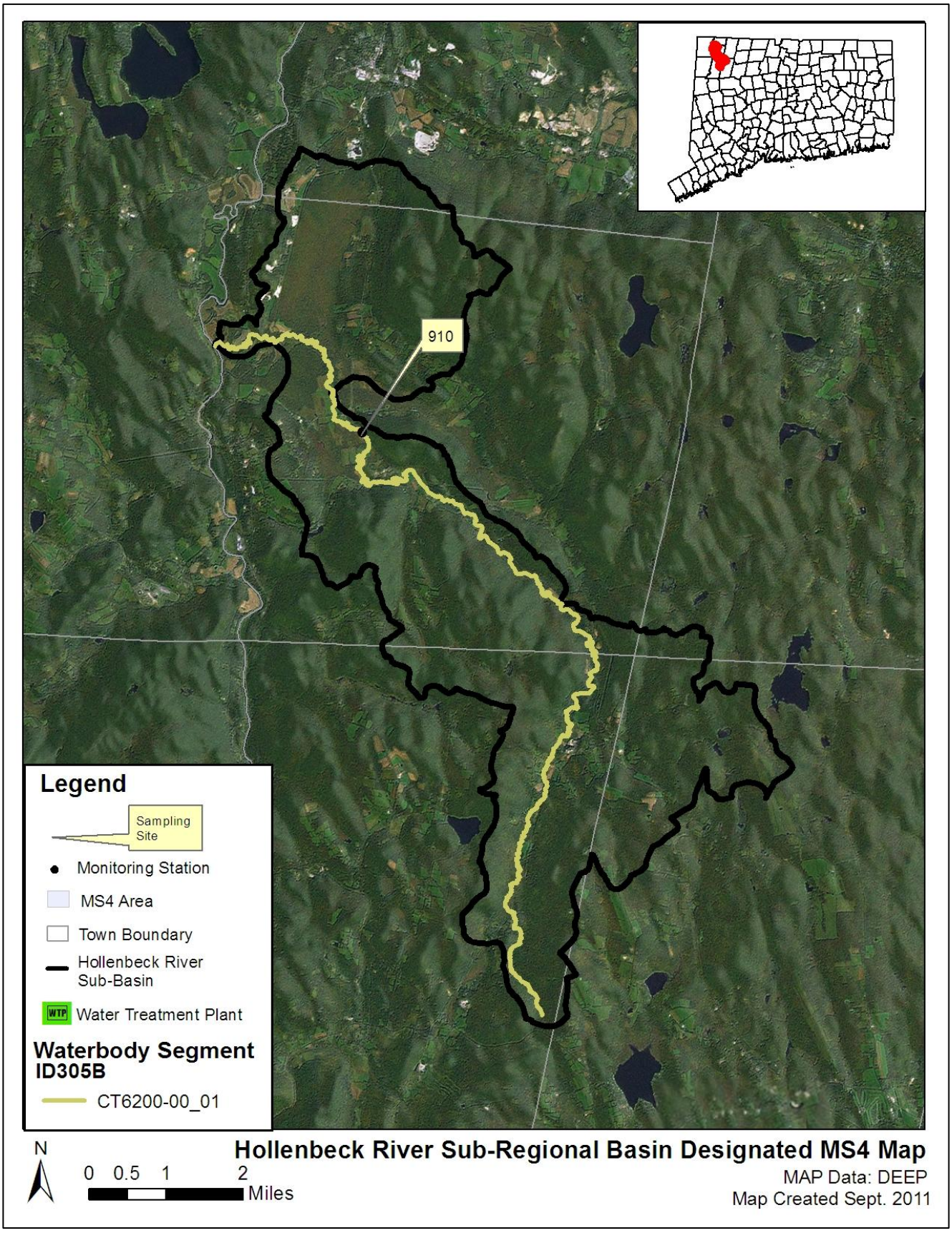
As previously noted, EPA can grant a waiver to a municipality to preclude their inclusion in the MS4 permit program. One reason a waiver could be granted is a municipality with a total population less than 1000 people, even if the municipality was located in a UA. There are 19 municipalities in Connecticut

that have received waivers, this list is: Andover, Bozrah, Canterbury, Coventry, East Hampton, Franklin, Haddam, Killingworth, Litchfield, Lyme, New Hartford, Plainfield, Preston, Salem, Sherman, Sprague, Stafford, Washington, and Woodstock. There will be no MS4 reporting documents from these towns even if they are displayed in an MS4 area in the maps of this document.

The list of US Census UCs is defined by geographic regions and is named for those regions, not necessarily by following municipal borders. In Connecticut the list of UCs includes blocks in the following Census Bureau regions: Colchester, Danielson, Lake Pocotopaug, Plainfield, Stafford, Storrs, Torrington, Willimantic, Winsted, and the border area with Westerly, RI (67 FR 11663). Any MS4 maps showing these municipalities may show grey areas that are not currently regulated by the CT DEEP MS4 permit program.

The impaired segment of the Hollenbeck River watershed is located within the Towns Canaan and Cornwall, CT. As there are no urbanized locations, as defined by the U.S. Census Bureau, within these areas, the towns are not MS4 areas and are not required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the CT DEEP (Figure 7). Information regarding stormwater management and the MS4 permit can be obtained on CTDEEP's website (http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654).

Figure 7: MS4 areas of the Hollenbeck River watershed



Publicly Owned Treatment Works

As shown in Figure 7, there are no publicly owned treatment works (POTWs), or wastewater treatment plants, in the Hollenbeck River watershed, and therefore, POTWs are not a potential source of loading to the impaired segment of the Hollenbeck River watershed.

Non-point Sources

Non-point source pollution (NPS) comes from many diffuse sources and is more difficult to identify and control. NPS pollution is often associated with land-use practices. Examples of NPS that can contribute bacteria to surface waters include insufficient septic systems, pet and wildlife waste, agriculture, and contact recreation (swimming or wading). Potential sources of NPS within the Hollenbeck River watershed are described below.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in many areas of the State. Runoff from agricultural fields may contain pollutants such as bacteria and nutrients (USEPA, 2011a). This runoff can include pollutants from farm practices such as storing manure, allowing livestock to wade in nearby waterbodies, applying fertilizer, and reducing the width of vegetated buffer along the shoreline. Agricultural land use makes up 11% of the Hollenbeck River watershed, particularly surrounding the impaired segment of Hollenbeck River. Hollenbeck River flows through several large agricultural areas in both Canaan, and Cornwall. These agricultural areas include hayfields, row crops, hobby farms, and livestock pastures (Figure 6). Two potential livestock farms were identified downstream of the headwaters near Route 63 in Cornwall, and south of Cobble Road along Route 63 in Canaan, both of which may be a source of bacterial contamination. Several areas, particularly the area between Lake Road and Ford Hill Road in Cornwall and downstream of the Route 7 crossing in Canaan, were identified as having significant exposed banking where adjacent hayfields were mowed right to the river bank, leaving little vegetative protection. Of the three identified agricultural waste sites in Figure 6, two are located near the impaired segment at the intersection of Route 63 and Route 43 in Cornwall.

Wildlife and Domestic Animal Waste

Wildlife and domestic animals within the Hollenbeck River watershed represent another potential source of bacteria. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. These physical land alterations can exacerbate the impact of natural sources on water quality (USEPA, 2001). As the majority of the impaired segment flows through undeveloped forested land, wildlife waste is a potential source of bacteria to Hollenbeck River. Residential development in the watershed near the impaired segment of Hollenbeck River may also be contributing waste from domestic animals, such as dogs.

Large open agricultural spaces and unbuffered shoreline along the impaired segment may be serving as geese attractants, which can create unsanitary conditions on the grassed areas and cause water quality problems due to bacterial contamination associated with their droppings (Figure 6). Large populations of geese can also lead to habitat destruction as a result of overgrazing on wetland and riparian plants.

Insufficient Septic Systems and Illicit Discharges

As shown in Figure 6, the entire Hollenbeck River watershed relies on onsite wastewater treatment systems, such as septic systems. Dry-weather sampling for Station 910 exceeded the WQS for *E. coli*; as such, groundwater contamination from nearby failing septic systems may be a source of bacterial contamination to the Hollenbeck River. Insufficient or failing septic systems can be significant sources of bacteria by allowing raw waste to reach surface waters. In Connecticut, local health directors or health districts are responsible for keeping track of any reported insufficient or failing septic systems in a specific municipality. The Towns of Canaan and Cornwall are part of the Torrington Area Health District (http://www.tahd.org/).

As shown in Figure 6, the Hollenbeck River watershed does not rely on the municipal sewer system. As such, sewer system leaks and other illicit discharges or connections are not a source of bacteria to nearby surface waters.

Stormwater Runoff from Developed Areas

Approximately 6% of the land use in the watershed is considered urban, and portions of the impaired segment are located near urban and residential development (Figures 4 and 9). Urban areas are often characterized by impervious cover, or surface areas such as roofs and roads that force water to run off land surfaces rather than infiltrate into the soil. Studies have shown a link between increasing impervious cover and degrading water quality conditions in a watershed (CWP, 2003). In one study, researchers correlated the amount of fecal coliform to the percent of impervious cover in a watershed (Mallin *et al.*, 2000).

While Figure 8 shows the entire watershed as having 0-6% impervious cover, land use in Figure 4 shows urban areas at the intersection of Route 7 and Route 63 and along major roads near the impaired segment of Hollenbeck River. Water quality data from Station 910 revealed much higher bacteria concentrations during wet weather than during dry, suggesting that stormwater pollution is a source to the Hollenbeck River (Table 7).

Figure 8: Range of impervious cover (%) in the Hollenbeck River watershed

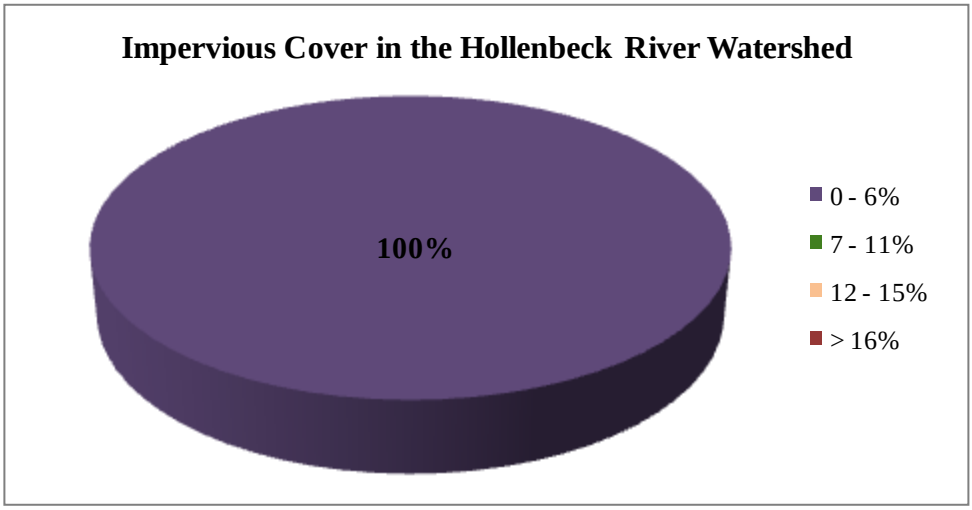
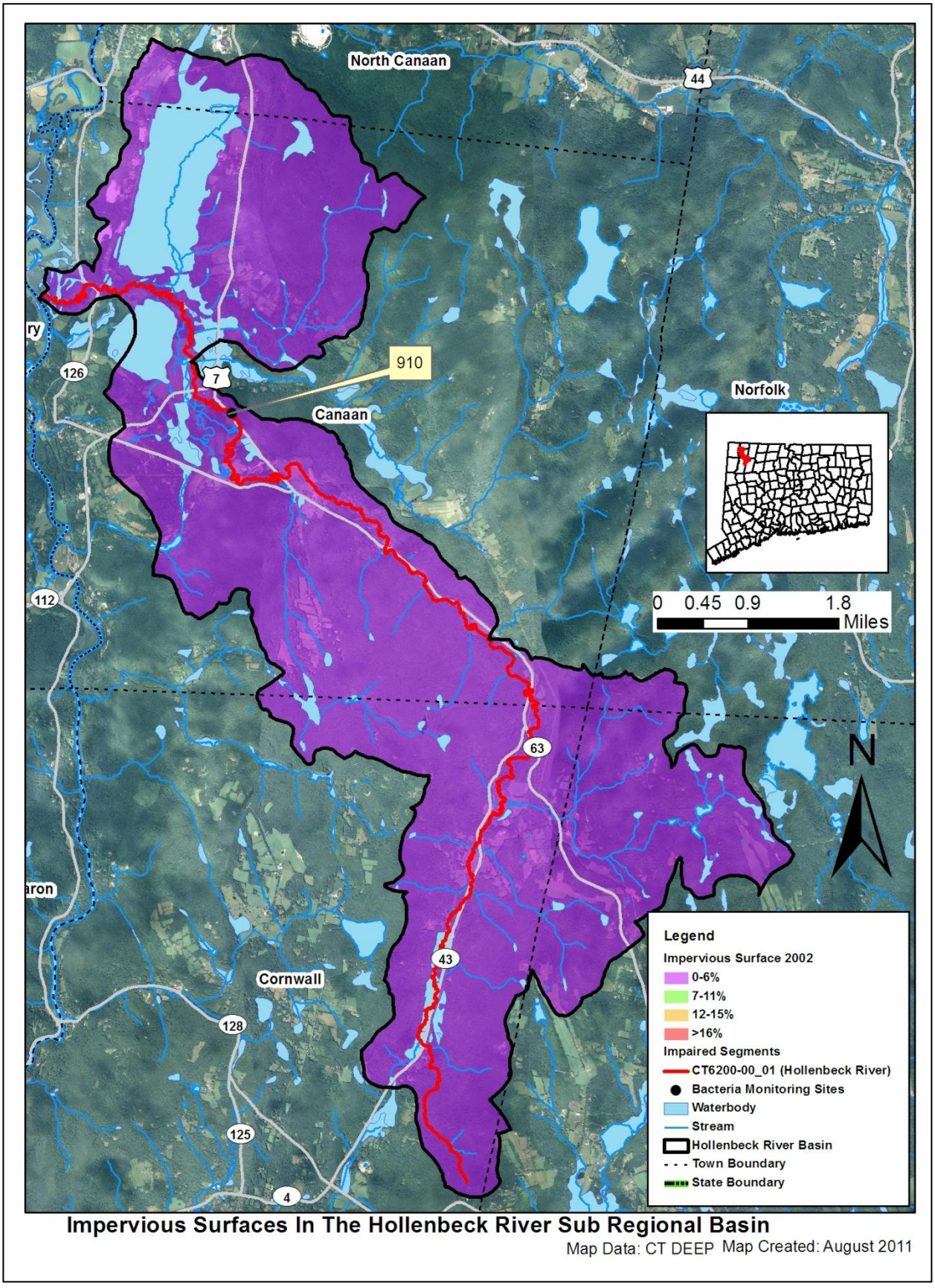


Figure 9: Impervious cover (%) for the Hollenbeck River sub-regional watershed



Additional Sources

Two landfills were identified along Route 7 in Canaan, and may be a source of bacterial contamination to the Hollenbeck River (Figure 6). There may be other sources not listed here or identified in Figure 6 that contribute to the observed water quality impairment in Hollenbeck River. Further monitoring and investigation will confirm the listed sources and discover additional ones. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement this TMDL.

Land Use/Landscape

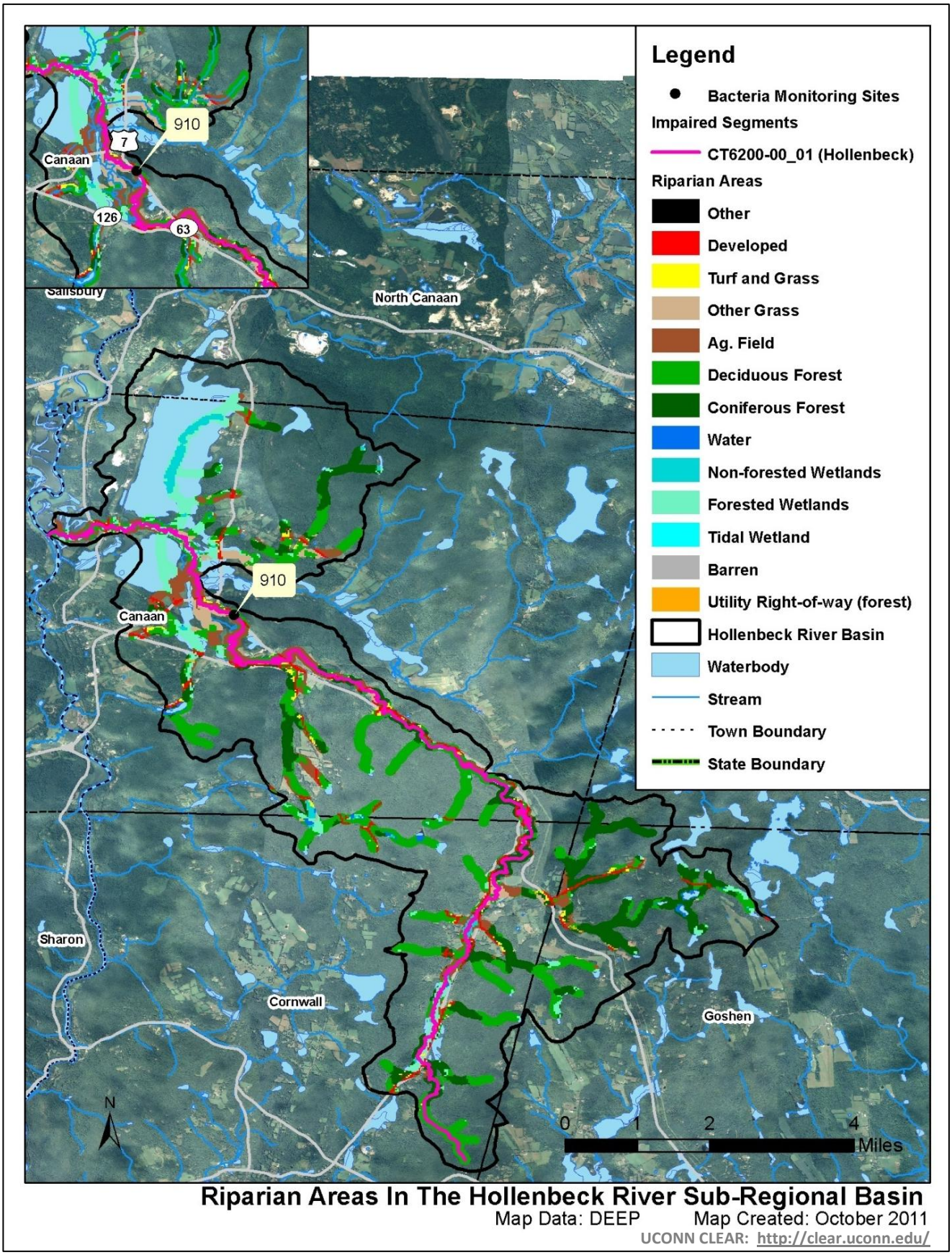
Riparian Buffer Zones

The riparian buffer zone is the area of land located immediately adjacent to streams, lakes, or other surface waters. The boundary of the riparian zone and the adjoining uplands is gradual and not always well-defined. However, riparian zones differ from uplands because of high levels of soil moisture, frequent flooding, and the unique assemblage of plant and animal communities found there. Through the interaction of their soils, hydrology, and vegetation, natural riparian areas influence water quality as contaminants are taken up into plant tissues, adsorbed onto soil particles, or modified by soil organisms. Any change to the natural riparian buffer zone can reduce the effectiveness of the natural buffer and has the potential to contribute to water quality impairment (USEPA, 2011b).

The CLEAR program at UCONN has created streamside buffer layers for the entire State of Connecticut (http://clear.uconn.edu/), which have been used in this TMDL. Analyzing this information can reveal potential sources and implementation opportunities at a localized level. The land use directly adjacent to a waterbody can have direct impacts on water quality from surface runoff sources.

The majority of the riparian zone for the impaired segment of Hollenbeck River is characterized by forested land use with portions of turf/grass, agricultural fields, and developed land uses (Figure 10). As previously noted, if not properly treated, runoff from agricultural and developed areas may contain pollutants such as bacteria and nutrients.

Figure 10: Riparian buffer zone information for the Hollenbeck River watershed



RECOMMENDED NEXT STEPS

Future mitigative activities are necessary to ensure the long-term protection of Hollenbeck River and have been prioritized below.

1) Ensure there are sufficient buffers on agricultural lands along Hollenbeck River.

Agricultural land use represents 11% of the Hollenbeck River watershed, and is a concern for water quality, particularly with several hayfields, row crops, and livestock farms identified along the impaired segment. If not already in place, agricultural producers should work with the CT Department of Agriculture and the U.S. Department of Agriculture Natural Resources Conservation Service to develop conservation plans for their farming activities within the watershed. These plans should focus on ensuring that there are sufficient stream buffers, that fencing exists to restrict livestock and horse access to streams and wetlands, and that animal waste handling, disposal, and other appropriate Best Management Practices (BMPs) are in place.

2) Evaluate municipal education and outreach programs regarding animal waste.

As most of the area surrounding the impaired segment is forested with some residential neighborhoods, any education and outreach program should highlight the importance of managing waste from horses, dogs, and other pets and not feeding waterfowl and wildlife. The town and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of Hollenbeck River that are frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. In addition, any educational program should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in Hollenbeck River and can harm human health and the environment. Animal wastes should be disposed of away from any waterbody or storm drain system. BMPs effective at reducing the impact of animal waste on water quality include installing signage, providing pet waste receptacles in high-use areas, enacting ordinances requiring the clean-up of pet waste, and targeting educational and outreach programs in problem areas.

3) Develop a system to monitor septic systems.

The entire Hollenbeck River watershed relies on septic systems, and Station 910 exceeded the WQS for *E. coli* for dry-weather sampling. If not already in place, the Towns of Canaan and Cornwall should establish a program to ensure that existing septic systems are properly operated and maintained, and create an inventory of existing septic systems through mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard systems within a reasonable timeframe can be adopted. The towns can also develop a program to assist citizens with the replacement and repair of older and failing systems.

4) Monitor permitted and potential leachate sources.

Of the two identified industrial activities permits in Figure 6, one is located along Route 7 at the Canaan Transfer Station near two landfills (Figure 6). A groundwater permit was also identified in Figure 6, but is located on the outskirts of the watershed boundary in Canaan, and is most likely a small source of bacterial contamination to the Hollenbeck River. Further monitoring will provide information essential to better locate, understand, and reduce pollution sources. If any current monitoring is not done with appropriate bacterial indicator based on the receiving water, then a recommended change during the next

permit reissuance is to include the appropriate indicator species. If facility monitoring indicates elevated bacteria, then implementation of permit required, and voluntary measures to identify and reduce sources of bacterial contamination at the facility are an additional recommendation. Regular monitoring should be established for all permitted sources to ensure compliance with permit requirements and to determine if current requirements are adequate or if additional measures are necessary for water quality protection.

Section 6(k) of the MS4 General Permit requires a municipality to modify their Stormwater Management Plan to implement the TMDL within four months of TMDL approval by EPA if stormwater within the municipality contributes pollutant(s) in excess of the allocation established by the TMDL. For discharges to impaired waterbodies, the municipality must assess and modify the six minimum measures of its plan, if necessary, to meet TMDL standards. Particular focus should be placed on the following plan components: public education, illicit discharge detection and elimination, stormwater structures cleaning, and the repair, upgrade, or retrofit of storm sewer structures. The goal of these modifications is to establish a program that improves water quality consistent with TMDL requirements. Modifications to the Stormwater Management Plan in response to TMDL development should be submitted to the Stormwater Program of DEEP for review and approval.

Table 6 details the appropriate bacteria criteria for use as waste load allocations established by this TMDL for use as water quality targets by permittees as permits are renewed and updated, within the Hollenbeck River watershed.

For any municipality subject to an MS4 permit and affected by a TMDL, the permit requires a modification of the SMP to include BMPs that address the included impairment. In the case of bacteria related impairments municipal BMPs could include: implementation or improvement to existing nuisance wildlife programs, septic system monitoring programs, any additional measures that can be added to the required illicit discharge detection and elimination (IDDE) programs, and increased street sweeping above basic permit requirements. Any non-MS4 municipalities can implement these same types of initiatives in effort to reduce bacteria source loading to impaired waterways.

Any facilities that discharge non-MS4 regulated stormwater should update their Pollution Prevention Plan to reflect BMPs that can reduce bacteria loading to the receiving waterway. These BMPs could include nuisance wildlife control programs and any installations that increase surface infiltration to reduce overall stormwater volumes. Facilities that are regulated under the Commercial Activities Stormwater Permit should report any updates to their SMP in their summary documentation submitted to DEEP.

Table 6. Bacteria (e.coli) TMDLs, WLAs, and LAs for Recreational Use

		Instantaneous *E. coli* (#/100mL)						Geometric Mean *E. coli* (#/100mL)	
Class	**Bacteria Source**	**WLA[6]**			**LA[6]**			**WLA[6]**	**LA[6]**
A	Non-Stormwater NPDES	0	0	0				0	
	CSOs	0	0	0				0	
	SSOs	0	0	0				0	
	Illicit sewer connection	0	0	0				0	
	Leaking sewer lines	0	0	0				0	
	Stormwater (MS4s)	235[7]	410[7]	576[7]				126[7]	
	Stormwater (non-MS4)				235[7]	410[7]	576[7]		126[7]
	Wildlife direct discharge				235[7]	410[7]	576[7]		126[7]
	Human or domestic animal direct discharge[5]				235	410	576		126

(1) **Designated Swimming.** Procedures for monitoring and closure of bathing areas by State and Local Health Authorities are specified in: Guidelines for Monitoring Bathing Waters and Closure Protocol, adopted jointly by the Department of Environmental Protections and the Department of Public Health. May 1989. Revised April 2003 and updated December 2008.

(2) **Non-Designated Swimming.** Includes areas otherwise suitable for swimming but which have not been designated by State or Local authorities as bathing areas, waters which support tubing, water skiing, or other recreational activities where full body contact is likely.

(3) **All Other Recreational Uses.**

(4) Criteria for the protection of recreational uses in Class B waters do not apply when disinfection of sewage treatment plant effluents is not required consistent with Standard 23. (Class B surface waters located north of Interstate Highway I-95 and downstream of a sewage treatment plant providing seasonal disinfection May 1 through October 1, as authorized by the Commissioner.)

(5) Human direct discharge = swimmers

(6) Unless otherwise required by statute or regulation, compliance with this TMDL will be based on ambient concentrations and not end-of-pipe bacteria concentrations

(7) Replace numeric value with "natural levels" if only source is naturally occurring wildlife. Natural is defined as the biological, chemical and physical conditions and communities that occur within the environment which are unaffected or minimally affected by human influences (CT DEEP 2011a). Sections 2.2.2 and 6.2.7 of this Core Document deal with BMPs and delineating type of wildlife inputs.

5) Identify areas along the Hollenbeck River to implement Best Management Practices (BMPs) to control stormwater runoff.

Although stormwater runoff from urban development may not seem like a significant source of bacterial contamination to the impaired segment of Hollenbeck River, there are still portions of the watershed near the impaired segment with impervious cover that should be mitigated for potential runoff. Wet-weather sampling at Station 910 exceeded the WQS for *E. coli*; as such, stormwater runoff is a concern for the water quality of Hollenbeck River (Table 7). To identify areas that are contributing bacteria to the impaired segment, the towns should continue to conduct wet-weather sampling along the impaired segment of Hollenbeck River. To treat stormwater runoff, the towns should install BMPs that encourage stormwater infiltration at areas along the impaired segment identified from the wet-weather sampling. These BMPs would disconnect impervious areas and reduce pollutant loads to the stream. More detailed information and BMP recommendations can be found in the core TMDL document.

BACTERIA DATA AND PERCENT REDUCTIONS TO MEET THE TMDL

Table 7: Hollenbeck River Bacteria Data

Waterbody ID: CT6200-00_01

Characteristics: Freshwater, Class A, Potential Drinking Water Supplies, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, Navigation, and Industrial and Agricultural Water Supply

Impairment: Recreation (*E. coli bacteria)*

Water Quality Criteria for E. coli:

Geometric Mean: 126 colonies/100 mL

Single Sample: 410 colonies/100 mL

Percent Reduction to meet TMDL:

Geometric Mean: **39%**

Single Sample: **90%**

Data: 2003, 2004, 2006-2009 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle

Single sample *E. coli* (colonies/100 mL) data from Station 910 on Hollenbeck River with annual geometric means calculated

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
910	Adjacent to Route 63 crossing at SNET pole #856	4/28/2003	30	dry	157
910	Adjacent to Route 63 crossing at SNET pole #857	8/12/2003	2500	wet	
910	Adjacent to Route 63 crossing at SNET pole #858	11/17/2003	52	dry	
910	Adjacent to Route 63 crossing at SNET pole #859	2/18/2004	10	dry	NA
910	Adjacent to Route 63 crossing at SNET pole #860	6/1/2006	75	dry	163
910	Adjacent to Route 63 crossing at SNET pole #861	6/14/2006	110	dry	
910	Adjacent to Route 63 crossing at SNET pole #862	6/29/2006	430	wet	
910	Adjacent to Route 63 crossing at SNET pole #863	7/12/2006	130	dry	
910	Adjacent to Route 63 crossing at SNET pole #864	7/19/2006	260	dry	
910	Adjacent to Route 63 crossing at SNET pole #865	7/26/2006	150	dry	
910	Adjacent to Route 63 crossing at SNET pole #866	8/2/2006	370	dry	
910	Adjacent to Route 63 crossing at SNET pole #867	8/9/2006	245[†]	wet	
910	Adjacent to Route 63 crossing at SNET pole #869	8/14/2006	96	dry	
910	Adjacent to Route 63 crossing at SNET pole #870	8/23/2006	86	dry	

Single sample *E. coli* (colonies/100 mL) data from Station 910 on Hollenbeck River with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
910	Adjacent to Route 63 crossing at SNET pole #871	6/6/2007	240	wet	206
910	Adjacent to Route 63 crossing at SNET pole #872	6/12/2007	260	dry	
910	Adjacent to Route 63 crossing at SNET pole #873	6/27/2007	86	dry	
910	Adjacent to Route 63 crossing at SNET pole #874	7/5/2007	320†	wet	
910	Adjacent to Route 63 crossing at SNET pole #876	7/10/2007	120	dry	
910	Adjacent to Route 63 crossing at SNET pole #877	7/17/2007	130	wet	
910	Adjacent to Route 63 crossing at SNET pole #878	7/25/2007	240†	wet	
910	Adjacent to Route 63 crossing at SNET pole #880	8/2/2007	350	dry	
910	Adjacent to Route 63 crossing at SNET pole #881	8/9/2007	560	wet	
910	Adjacent to Route 63 crossing at SNET pole #882	8/30/2007	170	dry	
910	Adjacent to Route 63 crossing at SNET pole #883	9/6/2007	160†	dry	
910	Adjacent to Route 63 crossing at SNET pole #885	9/13/2007	170	wet	
910	Adjacent to Route 63 crossing at SNET pole #886	5/22/2008	20	wet	171
910	Adjacent to Route 63 crossing at SNET pole #887	6/5/2008	110	wet	
910	Adjacent to Route 63 crossing at SNET pole #888	6/9/2008	655†	wet	
910	Adjacent to Route 63 crossing at SNET pole #890	6/19/2008	97†	wet	
910	Adjacent to Route 63 crossing at SNET pole #892	6/26/2008	160	dry	
910	Adjacent to Route 63 crossing at SNET pole #893	7/8/2008	98	dry	
910	Adjacent to Route 63 crossing at SNET pole #894	7/23/2008	930	wet	
910	Adjacent to Route 63 crossing at SNET pole #895	7/31/2008	1200	wet	
910	Adjacent to Route 63 crossing at SNET pole #896	8/4/2008	98	wet	
910	Adjacent to Route 63 crossing at SNET pole #897	8/14/2008	74	dry	
910	Adjacent to Route 63 crossing at SNET pole #898	9/9/2008	200	wet	

Single sample *E. coli* (colonies/100 mL) data from Station 910 on Hollenbeck River with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
910	Adjacent to Route 63 crossing at SNET pole #899	6/11/2009	160	wet	**208* (39%)**
910	Adjacent to Route 63 crossing at SNET pole #900	6/17/2009	120	wet	
910	Adjacent to Route 63 crossing at SNET pole #901	7/2/2009	**4100* (90%)**	wet	
910	Adjacent to Route 63 crossing at SNET pole #902	7/9/2009	86	dry	
910	Adjacent to Route 63 crossing at SNET pole #903	7/16/2009	200	dry	
910	Adjacent to Route 63 crossing at SNET pole #904	7/23/2009	120	wet	
910	Adjacent to Route 63 crossing at SNET pole #905	8/6/2009	110	dry	
910	Adjacent to Route 63 crossing at SNET pole #906	8/12/2009	180	dry	
910	Adjacent to Route 63 crossing at SNET pole #907	8/19/2009	230	dry	

Shaded cells indicate an exceedance of water quality criteria

†Average of two duplicate samples

***Indicates single sample and geometric mean values used to calculate the percent reduction**

Wet and dry weather geometric mean values for Station 910 on Hollenbeck River

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
910	Adjacent to Route 63 crossing at SNET pole #856	2003, 2004, 2006-2009	21	25	174	275	119

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gage at the Norfolk 2 SW in Norfolk, CT

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